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A Competency-Based Approach to Support e-Learning During the Covid-19 Situation

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Abstract: The Faculty of Education and Lifelong Learning of the University of Strasbourg implemented a competency-based approach during the academic year of 2020-2021. This study presents empirical research on students' perspectives of their self-regulation and self-direction in learning as one of the first feedbacks on this project. This research was conducted in an online course organised during the Covid-19 pandemic. It was hypothesised that the competency-based approach positively impacted students' self-direction within the course and their self-regulation in an online learning context. Anonymous pre- and post-surveys were conducted. The results confirmed the research hypothesis. The design of the course presented could serve as a valuable input to define appropriate learning scenario to increase students' self-regulation and self-direction in e-learning.

Keywords: competency-based approach, e-learning, self-regulation, self-direction, instructional design

1. Introduction

Mallillin et al. (2021) stated that the competency-based approach was one of the most appropriate teaching approaches to adopt during the covid-19 pandemic due to its evident learning stages, expected competencies, and targeted knowledge. The approach also ensures the completion of educational goals through the flexibility and accessibility provided by the online learning environment. Moreover, through the adoption of this approach, lecturers are encouraged to establish strategies focusing on students' learning processes that fit into the new modality of online classes. This means that students receive guidance in their online learning while having control over their activities. A competency-based approach confronts students with real-life professional situations. Students are trained to perform professional tasks and to initiate or complete a project (Fall, 2018) which help to enhance their self-direction in learning (Tsai, 2020). It also provides reflective time for students to be aware of the development of their competencies (Kirk and Courtner, 2020). Reflective work also helps students prove mastery of targeted competencies and develop their self-regulation in learning (Poumay et al., 2020).

During France's second national lockdown due to the covid-19 situation, the Faculty of Education and Lifelong Learning of the University of Strasbourg implemented a competency-based approach to promote students' professionalisation, also known as the Accompli project. This study presents empirical research on undergraduate students' perspectives on their self-regulation in online learning and their self-direction in response to the implementation of the Accompli project within the Instructional Design in the Digital Age course (*Ingénierie de l'éducation à l'ère du numérique*).

The studied group never experienced a competency-based approach during their study in the institution but had had their first online learning experience during the first lockdown. Due to their lack of preparation for online learning, this question remains: Can the competency-based approach help students to enhance their self-direction in the course and the aptitude to self-regulate their e-learning activities? The purpose of this study was to investigate students' self-direction and self-regulation in an online learning context in which a competency-based learning approach was adopted. To ensure these aspects, the competency-based approach adopted put emphasis on active learning activities that targeted students' sense of initiative and critical thinking. Both are competencies required to develop self-regulation and self-direction in learning. Consequently, we hypothesised that the competency-based approach could positively impact students' self-direction in the course and their aptitude to self-regulate their learning despite their lack of preparation for online learning. Anonymous pre- and post-survey were conducted to get insight into students' perception of their self-regulation strategies in e-learning and their self-direction within the course. The results confirmed the research hypothesis and highlighted students' ability to seek peer support and aptitude to control the learning environment as the indicators of significantly increasing self-regulation in e-learning. As for students' self-direction in the course, the results also highlighted its development.

2. Literature review

2.1 Competency-based approach and e-learning

As defined by Fall (2018) the competency-based approach was built not only on the competencies inherent to the exercise of a profession but also on the competencies expected by society. According to Bouzeriba and Kouadria (2018), the competency-based approach implied giving meaning to the practices and knowledge taught. Based on these definitions, the aim of the competency-based approach is for students to be able to apply what they have learned, manipulate a certain number of acquired competencies under specific conditions, design a plan of actions, and implements resources in a practical and technical context, first in a learning situation, then later in a socio-professional environment. Fall (2018) pointed out five stages of competence acquisition according to a learning logic:

- 1. Discovery, motivation, and commitment. In this stage students learn about a targeted profession by exploring the required competencies to complete the tasks in this phase.
- 2. Essential learning. During this stage, fundamental concepts related to the duties and tasks to be performed are studied.
- 3. Integration and exercise of real tasks. Students are confronted with real-life situations in which they perform professional tasks in this stage.
- 4. Transfer. In this phase, the tests and tasks become the subjects of evaluation to measure the achievement of the targeted competencies of the aimed profession. Students can self-assess their mastery of targeted competencies and the development of their personal objectives in relations to the course objectives.
- 5. Enrichment.

By its very nature, the competency-based approach provides experiences that transform students' learning situations. Mallillin et al. (2021), and Lancaster and Lundberg (2019) pointed out that competency-based approach enhances students' engagement. Indeed, the fact that the students have control over time, place, and strategy to learn promotes students' learning ownership. The competency-based approach may also be one of the best modalities of teaching approaches to adopt during the new normal situation since it allows clear demonstrations of the competencies and knowledge developed by learners through the stages (Mallillin et al., 2021). During the Covid-19 or the new normal learning context, almost all teaching and learning are online. Hence, lecturers need to develop teaching and learning scenarios that support student-centred learning so that students get student-focused learning experiences and are able to perform deep learning. Mallillin et al. (2021) highlighted that adopting a competency-based approach in online learning ensure the completion of educational goals and achievement through interaction, flexibility, and accessibility. According to Mallillin et al. (2020) lecturers, through competency-based approach, could establish strategies focusing on the learning process while providing instructions fit with the new modality of online classes. This means students are well guided in their e-learning, and at the same time, having control of their activities. In this regard, Tsai (2020) and Kirk and Courtner (2020) highlighted that adopting an online competency-based approach enhanced students' self-direction in learning. In the stage of "Transfer", students can do a self-assessment or reflective work. This may help students to prove mastery of the targeted competencies. On this subject, Poumay et al. (2020) confirmed that along with students' interaction and discussion with peers and lecturers, the reflexive phase can also be beneficial for developing self-regulation in learning.

2.2 Targeting students' self-direction and self-regulation

Rimini and Spiezia (2016) reported for the OECD that the fundamental skills for coping with the current dynamic and digital world, as well as the labour market, included self-direction. Self-directed learning is a concept related to one's cognition, metacognition, self-direction, and self-directedness. According to Kirk and Courtner (2020), self-directed learning generally involved adult learning in various forms and included learning activities that one performed at will, such as participating in a project and voluntarily returning to school. Additionally, Knowles (1975, p. 18) defined self-direction as "a process in which individuals take the initiative, without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and integrating appropriate learning strategies, and evaluating learning outcomes". Subsequently, self-directed learning involves one's control of their learning, as Merriam and Brockett (2007) highlighted. Students' self-direction in learning is not innate. The triadic reciprocity developed by Albert Bandura highlights essential determinants that influence one's behaviour: the individual (highlighting how one thinks,

feels, and regards their previous experience), and the environment. For Bandura, cited in Carré (2003), each determinant has a reciprocal relationship as one's reaction to their environment leads to a particular behaviour that is also influenced by their personal traits, prerequisites, and experiences. Consequently, if lecturers would like their students to develop a particular behaviour as self-direction, it is essential to create a self-directed learning scenario that would be the most fitted design to support their objectives.

According to Guglielmino (1997), cited in Kirk and Courtner (2020), a person who has a high level of self-direction shows initiative and commitment to learning, understands the importance of learning or the task he wishes to complete, is able to be in control of their own learning, is autonomous and accepts responsibility for his actions during learning or task completion, perceives problems as challenges, has self-confidence, is able to identify his skills and uses it, is able to organize his time and sets a learning pace according to his needs, is goal-oriented, and enjoys learning. Indeed, self-direction can be regarded as a psychological state or a personal characteristic as well as one's behaviour in learning (Adinda, 2020). As a research-based concept in adult education field introduced in France in the late 1980s (Carré et al., 2011), self-direction shares common characteristics with self-regulation. Hadji (2012) defined self-regulation as the ability of an individual to conduct the regulation of his or her activity. From an action perspective, self-regulation can be seen as an individual's ability to observe and evaluate himself or herself (Zimmerman, 2002) in achieving his or her personal goals (Zimmermann, 2005). Similar to self-direction, self-regulation involves metacognition and generally indicates one's active participation in learning (Saks and Leijen, 2014) by producing favourable behaviours, such as performance control, and critical thinking mobilization which lead to the achievement of his/her goals (Poumay et al., 2020). However, self-direction requires individuals to take initiatives in their own learning (Hadji, 2012) in a more extensive way. This involves, among other things, their ability to identify their goals and needs, the formulation of their learning goals and regulation of learning strategies, as well as the ability to identify resources to attain their goals (Carré, 2010).

To sum up, among the similarities identified between self-direction and self-regulation, the most shared element is the self-orienting actions in task completion, such as defining the meaning of the task, identifying an appropriate strategy, and monitoring plan to achieve the targeted goals (Saks and Leijen, 2014). While emphasizing the role of "self" in self-directed learning to ensure the development of self-direction, Brookfield (1985) and Long (1989), cited in Kirk and Courtner (2020), stated that self-direction took place in a social context and could not be completed in solitude. It is also the case for self-regulation. Various studies highlighted that lecturers' interventions in a learning situation (instructions, adaptation of the time allocated to the task, etc.), and their direct interactions with the students can influence students' self-regulation of learning (Poumay et al., 2020). In an e-learning context, Cosnefroy, Fenouillet and Heutte (2019) included peer support and procrastination brought by the challenges of online learning as important elements to measure individuals' self-regulation.

Therefore, it was hypothesised that adopting the competency-based learning scenario could positively impact students' self-direction and self-regulation in an online learning context. However, the only experience that observed students had in online learning was during the first national lockdown. Since the Accompli project is an innovative pedagogical project that has been newly accepted, it can be assumed that students have never experienced a competency-based approach beforehand. With the students' specific profile and within the uncommon setting of online learning due to the pandemic, there was a need to investigate whether the competency-based approach could help students enhance their self-direction in the course and their aptitude to self-regulate their e-learning activities. The elements presented in this section construct the instructional design of the teaching and learning scenarios involving the competency-based approach of the present study, and in the following sections, the methodology that has been set up, as well as the findings, will be detailed.

3. Materials and methods

3.1 The instructional design of the course

This study was conducted in a course called Instructional Design in the Digital Age (*Ingénierie de l'éducation à l'ère du numérique*). To adopt a competency-based approach, the initial competencies targeted by the Faculty of Education and Lifelong Learning for this course have been revisited. Some wordings have been made to adjust with the essential competencies of an instructional designer as defined by the French National Directory of Professional Certifications (*Répertoire national des certifications professionnelles*) (See Figure 1).

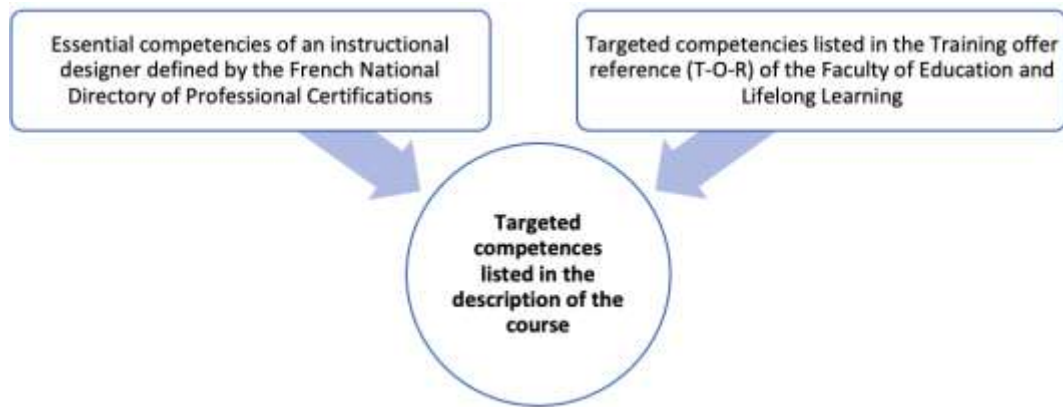


Figure 1: Defining the targeted competencies of the course

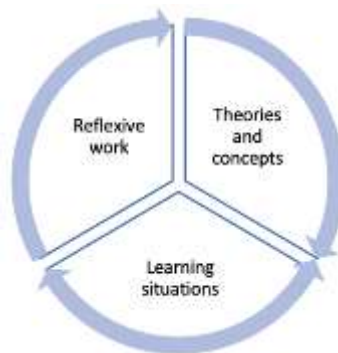


Figure 2: Three action phases of the course

This course was initially an offline course. However, the current context of the pandemic required the digitization of the course content and activities. An online forum was provided to support students' communication among themselves and with the lecturers after class time. Some online collaborative tools such as online mind/concept map tools, online graphic design platform such as Canva, online collaboration tools provided by Google®, collaborative online board such as padlet.com, scrmbler.ca, etc., were provided to support students' online learning and the completion of their projects. Students were also free to use other collaboration and communication tools such as Messenger®, Facebook® chat, Whatsapp® group, etc., to support their learning. The University of Strasbourg uses Moodle® as their learning management system (LMS), and to support the online learning sessions, the BigBlueButton®, an open-source web conferencing system for online learning, is integrated within Moodle. Figure 2 above shows the three phases of actions adopted in the course, and Table 1 below presents the conduct of the course sessions. To support students' active participation within the course, they were invited to work in groups of three to four to design a pedagogical project and conduct it. Table 1 shows that the first three online meetings were organised to deliver the course content and strengthen students' knowledge on the theory, concepts and notions presented. During the regular lectures, some non-graded online quizzes were provided. The objective was to ensure students' comprehension of the course materials. As for online tutorial sessions, the focus was on the completion of group projects. To ensure the progress of the course and the completion of students' pedagogical projects, starting from the third online meeting, the regular lectures were paired with the tutorials within the same week.

Table 1: Conduct of the online courses' sessions

Regular lectures	Tutorials
Regular lecture 1 Introduction Defining instructional design	
Regular lecture 2 Semantic network of the concept of instructional design	
Regular lecture 3 Dynamics of instructional design: Knowledge references Task: Analyse a training need and the profile of the learners	Tutorial 1 Dynamics of instructional design: Knowledge references Task: Design a teaching and learning situation using digital technology (1/4)

Regular lectures	Tutorials
Regular lecture 4 Dynamics of instructional design: Design process Task: Make a list of tips to plan a training	Tutorial 2 Instructional design and digital technology: Pedagogical functions of the digital technology Task: Design a teaching and learning situation using digital technology (2/4)
Regular lecture 5 Discovering the types of teaching and learning plan: Planning a training outline Preparation for Written test 1	Tutorial 3 Using a concept map to support the reflection and the structure of training Written test 1
Regular lecture 6 Developing teaching resources Task: Make a list of tips for developing training material/designing resources for training	Tutorial 4 Task: Design a teaching and learning situation using digital technology (3/4)
Regular lecture 7 Task: Design a teaching and learning situation using digital technology (4/4) Conduct a sequence of the project (25 min/team)	Tutorial 5 Conduct a sequence of the project (25 min/team)
	Tutorial 6 Reflective work on skills developed during the course Written test 2

For the completion of the pedagogical projects, students were invited to define the public (the targeted recipients of their projects) and the objective of their projects by assessing their public's needs. As for the instructional design of the projects, students were prepared to be able to 1) characterize the knowledge and identify the elements to be taught in their pedagogical project by considering the results of their public's needs analysis, 2) integrate digital technology to support their project, 3) prepare a specific sequence of their pedagogical project to be conducted online at the end of the semester, and 4) carry out the projects while generating constructive feedback from teachers and peers who attended the project presentation and experienced the learning sequence organised. In fact, in this course, students were encouraged to showcase their initiatives and critical thinking skills to develop their project management skills and sharpen essential soft skills to complete their projects. Since students had to define the objectives and the essential steps of their projects themselves, this teaching scenario would be beneficial for the development of students' self-direction within the course.

3.2 Population observed

The study was on undergraduate students majoring in Advising and Training for Skill Development and Social Integration (*Conseiller et former pour les compétences et l'insertion*) enrolled in the Faculty of Education and Lifelong Learning of the University of Strasbourg. This study was administered during the spring semester of 2020-2021 academic year. All 28 participants were informed about the main objective of implementing the competency-based approach and the experiment without disclosing the hypothesis to maintain students' objectivity while filling out the questionnaires. Students' participation was voluntary and for the research publication's purposes their participation was kept confidential and anonymous.

This study was conducted in the Instructional Design course, an obligatory course for all enrolled students. Twenty-seven students have participated in the post-test. However, only 15 students completed both the pre- and post-tests. This showed 54% of participation rate, which was satisfactory for an online questionnaire. The number of students participated in the post-test compared to the pre-test served as evidence of the increase of students' involvement towards the end of the course.

Table 2: Study sample

Academic year	Number of enrolments	Participants of the pre-test	Participants of the post-test	Participants of the pre and post-test	Participation rate to the pre and post-test (in %)
2020-2021	28	15	27	15	54%

3.3 Data collection and analysis procedures

The main hypothesis of this research was that the competency-based approach positively impacted students' self-direction within the course and their self-regulation in e-learning despite their lack of preparation for online learning. To study this hypothesis, questionnaires measuring students' readiness to perform self-directed learning in the course and their aptitude to self-regulate their learning strategies in an online learning environment were deployed. The first instrument was specifically created for the course. It was a fifteen-item questionnaire with a seven-point Likert scale representing participants' attitudes ranging from "not at all" to "completely". These items were divided into three indicators: self-determination, self-regulation, and self-efficacy. The Cronbach's alpha for this scale was 0.999. The correlation of the indicators of the scale was also very satisfactory (See Table 3), meaning that this scale was reliable, and the results generated could represent the objective of its conception.

Table 3: Pearson's correlations

Variable		Total of the scale	Self-determination	Self-regulation
Self-determination	Pearson's r	0.878	—	—
	p-value	< .001	—	—
Self-regulation	Pearson's r	0.974	0.838	—
	p-value	< .001	< .001	—
Self-efficacy	Pearson's r	0.912	0.630	0.855
	p-value	< .001	0.012	< .001

The second scale was designed by Cosnefroy, Fenouillet and Heutte (2019). The scale consisted of 24 items distributed into four indicators or sub-scales namely procrastination, control of the context, learning strategy, and peer support. Participants were asked to self-position themselves using a seven-point Likert scale, representing participants' attitudes ranging from "not at all" to "completely". The Cronbach's alpha for this scale was 0.996, which was very satisfactory. All scales were administered through the Limesurvey® of the University of Strasbourg, and the access was provided through the course's learning management system, Moodle®. The pre-test was organized at the beginning of the semester, and the post-test was administered at the last course of the semester, during the Tutorial 6. For data analysis, the paired samples t-test was applied to all students who have participated in the pre-and the post-test to determine any significant development of students' self-direction and self-regulation within the course. The overall methodology is summarized in Table 4.

Table 4: Research methods and analysis framework

Objectives	Instruments	Analysis framework
Evaluate students' self-direction in learning before and after the course module	Scale created for the study	Paired samples t-test
Evaluate students' self-regulation in online learning before and after the course module	Self-regulation scale for online learning (Cosnefroy, Fenouillet and Heutte, 2019)	

4. Results

This study targeted the impacts of competency-based approach implemented on e-learning on students' self-direction within the course and their self-regulation in an online learning environment. To highlight this aspect, two scales were dispensed. The studied variables were students' level of self-direction and self-regulation in e-learning before and at the end of the course period. With 54% participation rate, a student t-test was conducted to identify any development or regression of studied elements.

4.1 Measuring students' self-direction

The results showed that 67% of students have progressed, and a Gain score of 16% was identified. These results were supported by the paired samples t-test results which showed that students' self-direction within the course has significantly progressed over a semester, and it was at a significant level from 70.1 to 75.6 ($t=-2.471$; $p<.05$; $df=14$). Figures 3 below represents the dynamics of students' self-direction levels at the pre- and post-tests. These histograms show that fewer students obtained scores less than 60 in the post-test.

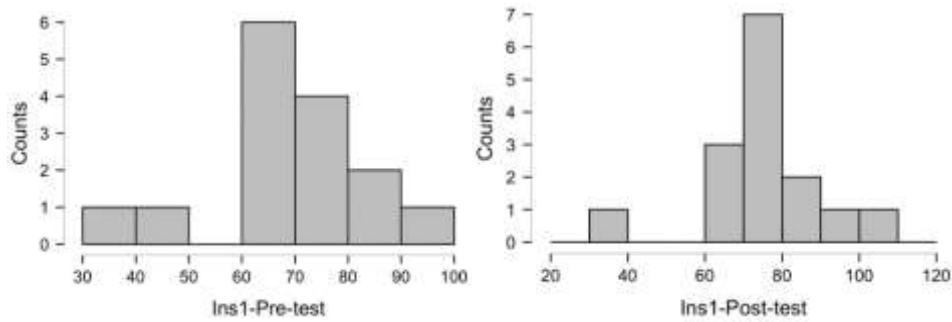


Figure 3: Students' scores for pre- and post-tests of instrument 1

Score progressions were identified within the three indicators of this scale (see Table 5). However, self-determination and self-efficacy became the only variables that significantly progressed from 20.1 to 22.7 and from 24.5 to 26.5, respectively. As for students' self-regulation within the course, the progression of this variable from 25.5 to 26.4 was identified but was not of a significant level ($t=-0.994$; $p=0.169$; $df=14$).

Table 5: Pre and post-test results per indicator of instrument 1

Indicator	Pre-test Mean score	Post-test Mean score	t	df	p-value
Self-determination	20.1	22.7	-2.120	14	0.026
Self-efficacy	24.5	26.5	-2.981	14	0.005
Self-regulation	25.5	26.4	-0.994	14	0.169

4.2 Measuring students' self-regulation

The results were interesting because according to the Pearson's correlation performed on students' self-regulation within the course and their readiness to self-regulate their learning in an online environment (the second instrument of the study), these two elements were correlated (Pearson's r : 0.567, p -value: $<.05$). Moreover, the second scale used to measure students' self-regulation in an online environment identified significant progress of this variable (Figure 4). The paired-samples t -test administered shows that students' scores progressed from 94.9 to 102, and the p -value of these results indicated that this progression was statistically significant (see Table 6). The Figure 4 below also shows that no students obtained score less than 80 in the Post-test.

Table 6: Paired samples T-test results of instrument 2 (Cosnefroy, Fenouillet and Heutte, 2019)

	t	df	p-value
Pre-test – Post-test	-2.419	14	0.015

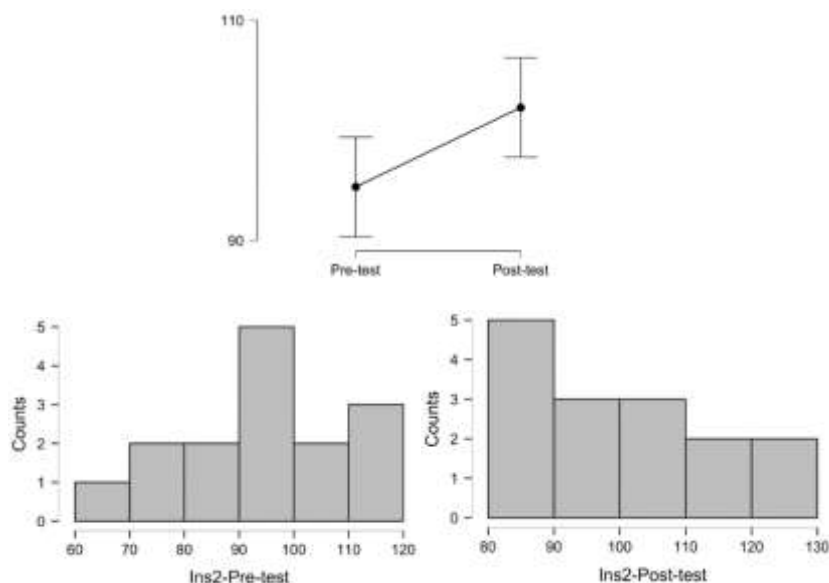


Figure 4: Students' scores for pre- and post-test of instrument 2 (Cosnefroy, Fenouillet and Heutte, 2019)

It was good to see that students' procrastination did not progress significantly, and students' control of the learning context as well as their aptitude to benefiting from the presence of their peers, seeking help, and offering help in an online environment, which was covered by the indicator of peer support, developed significantly (See Figure 5 and Table 7). The indicator of students' procrastination highlighted the challenges students might experience during online learning. The challenges which lead to procrastination included difficulties in planning the work, lack of motivation, concentration problems, and feelings of boredom. Consequently, the positive result highlighted in this study indicated that the learning scenario and environment provided can successfully help students overcome the e-learning challenges. However, the results indicated that students needed support to develop their learning strategy.

Table 7: Pre- and post-test results per indicator of instrument 2 (Cosnefroy, Fenouillet, and Heutte, 2019)

Indicator	Pre-test Mean score	Post-test Mean score	t	df	p-value
Procrastination	19.7	20.8	-0.604	14	0.278
Control of the context	28.5	31.6	-1.904	14	0.039
Learning strategy	24.3	25.2	-0.698	14	0.248
Peer support	22.3	24.5	-1.693	14	0.062

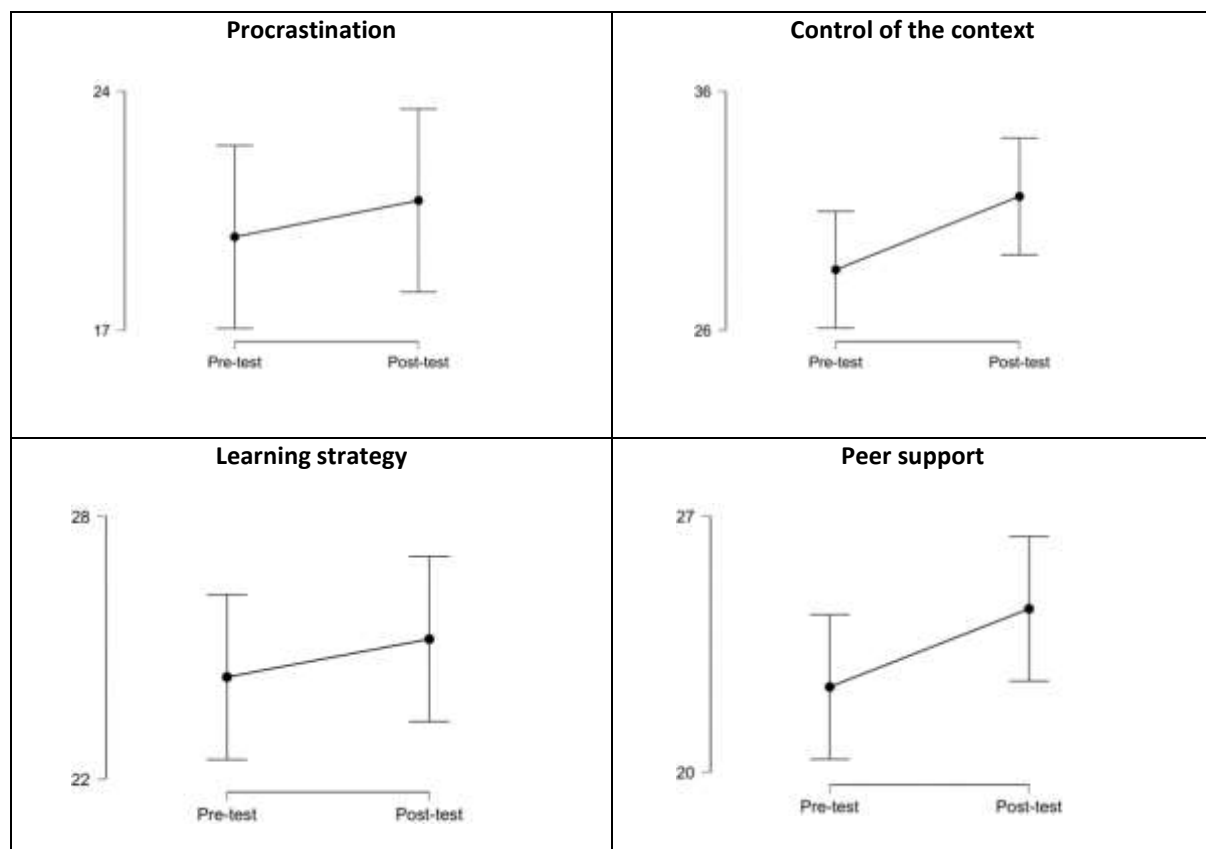


Figure 5: Indicators of Instrument 2 (Cosnefroy, Fenouillet and Heutte, 2019)

5. Conclusion and future work

The results showed that the competency-based approach supported the development of students' self-direction and self-regulation within the general online learning context. These findings have confirmed the research hypothesis of this study and demonstrated encouraging results regarding students' readiness for future online learning despite their lack of experience prior to participating in the studied module. It was also good to see that the learning scenario supported by this learning approach did not significantly contribute to students' procrastination during online learning. However, the need for help in refining students' online learning strategies was identified in the research findings. The Pearson's correlation performed on students' self-regulation within the course and their readiness to self-regulate their learning in an online environment showed that these two elements were correlated. However, based on the results of the paired t-test administered on each indicator in both scales, student self-regulation in the course became the only indicator for which student scores did not

experience a significant increase. Since the two scales used were developed in different research work, it could be assumed that this difference might have been the result of the different indicators provided. Further studies related to this outcome are necessary to understand better the relationships between students' self-regulation in general and specific learning contexts. Ponton and Carr (2016) stated that the higher one's degree is, the higher his self-directed learning readiness will be. In confirmation to this statement, Kirk and Courtner (2020) stated that generally one's self-direction in learning increases when he is about to pursue his education above the bachelor level. It is interesting to explore participants' self-direction in a general learning context as well as to observe participants in their future master's studies. Finally, it is intriguing to investigate the development of students' self-direction over several years starting from their very first year of undergraduate study.

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